Section 404(b)(1) Evaluation
Emergency Repair of the Fern Ridge Embankment Dam
Lane County, Oregon

I. Introduction

Background

Fern Ridge Lake supports an extensive emergent marsh comprised of native and non-native wetland species, including hard-stem bulrush and cattail, but dominated by reed canarygrass. Under normal filling and operation of the reservoir, these marshlands are flooded in early April and remain flooded through all of the waterfowl and wading bird breeding season, typically through mid September.

The Willamette Valley of Oregon has experienced a reduction in the quantity and quality of wetland marsh habitat due to agricultural conversion and urban/industrial development. Concurrent to marsh habitat losses to development, reed canarygrass has attained vegetative dominance in much of the remaining habitat. While reed canarygrass does provide emergent fish and wildlife habitat, it tends to form a monoculture, reducing vegetative diversity and wildlife forage potential of the marshes. Common carp, an introduced species that occurs in Fern Ridge Lake, adversely impacts water quality and destroys native aquatic plants. The presence of both these exotic species (carp and reed canarygrass) have combined to decrease habitat quantity and quality of remaining wetlands, and thereby populations of wintering and breeding waterfowl, migrant and wintering shorebirds, resident wading birds, reptiles and amphibians and other marsh-associated species in the Willamette Valley.

Project operation for flood control purposes provides an artificial hydrologic environment (e.g., summer flooding and winter drawdown) that favors reed canarygrass establishment rather than native marsh plant communities. Over the past 20 years, substantial effort has gone into constructing and managing impoundments within the pool to mimic a more natural hydrologic regime. The most recent impoundments were constructed to exclude carp because of their destructive effect on the habitat. Water level management is the only way that long-term conversion of reed canarygrass marsh can be achieved over large areas. The U.S. Army Corps of Engineers (Corps) and Oregon Department of Fish and Wildlife (ODFW) now have the ability to manage water levels in 900 acres of impoundments separately from the lake's water level by means of pumping; this has been an invaluable tool for restoration of native marsh vegetation for moist soil management, and associated fish and wildlife values.

The ODFW manages the 5,000 acre Fern Ridge Wildlife Management Area (FRWA) under license from the Corps. The FRWA is managed to attract and hold wintering waterfowl and provides a very popular waterfowl-hunting program. Over the last decade, strategies to provide winter foods for waterfowl have evolved from crop production to moist soil management techniques that provide superior native foods and also support species diversity goals by providing habitat to a host of native wildlife species, in addition to waterfowl. In terms of the habitat provided, these structures in some cases are high quality native wetlands.

Purpose and Need

The purpose of the proposed action is to perform an immediate, emergency repair of the drainage system for the embankment dam at the Fern Ridge Lake project, located on the Long Tom River in Lane County, Oregon, about 6 miles west of the Eugene/Springfield metropolitan area. The main

dam is a zoned, rolled-earth embankment with a maximum height of 50 feet and a total length of approximately 6,500 feet. Seepage and water levels inside the dam are controlled by an internal drainage system. The main drain line, running the entire length of the dam, is an 8-inch perforated metal pipe. Eleven lateral lines drain the water from the interior of the dam, under the county highway and into Kirk Pond. The drainage system is over 60 years old and the embankment dam is in an active state of failure. The needed emergency repair would eliminate the risk of a catastrophic failure of the dam, prevent flood damages downstream from future storm events, and restore full benefits, including flood damage reduction, irrigation, recreation, fish and wildlife, and water quality.

Significant distress has been observed at the embankment dam since July 2002 when the Corps noted the existence of a sinkhole on the downstream face of the dam. The following gives a historical accounting of subsequent investigations and findings for the dam.

- February 2003. During the filling of the reservoir for the 2003 conservation season, two additional sinkholes developed. Also, seepage of water was found at the downstream toe of the dam and turbid water was found in the drain system.
- May 2003. The Portland District issued a pre-emergency notification to local, state and federal agencies.
- January 2004. Stability concerns related to the sinkholes and seepage were ruled out. Although no conclusive data tied the muddy drain water to a piping/internal erosion failure, all instruments (flow meters and piezometers) were automated for real-time monitoring. Alarm thresholds also were established.
- August/September 2004. The first conclusive evidence of a piping/internal erosion failure was found. Water flows and sediment volumes increased by 15 percent and 250 percent, respectively.
- December 2004. A panel of nationally recognized experts in the field of dam safety was consulted to help assess the nature and extent of the problems at Fern Ridge and give recommendations on the nature and timing of repairs.

The Expert Panel determined that the embankment dam at Fern Ridge was in an active state of a piping/internal erosion failure and recommended ‘immediate’ operating restrictions and that a repair of the drain system be expedited. Key findings were as follows:

- A piping failure is underway.
- There is a 20 to 30 percent chance of a catastrophic failure occurring if the dam is operated at normal levels.
- Operating restrictions are required.
- Even at minimum pool, the dam appears to be deteriorating. The condition of the dam would steadily worsen; the rate of deterioration would be determined by how often the pool is raised.

The Expert Panel recommended that the reservoir elevation be restricted to no higher than elevation 360 feet National Geodetic Vertical Datum (NGVD; all elevations in this document are in NGVD) until the dam is repaired. On December 17, 2004 the Corps placed this pool restriction on Fern Ridge reservoir, with the restriction to continue until repairs are completed on the aging dam. This year-round restriction on operating levels was adopted to ensure the public’s safety.

II. Description of Proposed Action

Proposed Action

The Corps proposes to construct a new drainage system for the Fern Ridge embankment dam. Construction is planned to occur over a period of 7 months during the driest part of the year, beginning in May and ending in November 2005. To lower head and ensure the effectiveness of the dewatering system, the reservoir will be kept at an elevation of 355 feet (about 5,230 acre-feet or 1,330 surface acres). The pool may be lowered up to an additional 5 feet to elevation 350 feet (about 793 acre-feet or 480 surface acres) during construction for a number of reasons, such as to reduce head further for construction, to provide flow into the lower Long Tom River and Kirk Pond/Coyote Creek, or by natural evaporation.

The embankment excavation and replacement will include both east and west portions of the earthen embankment (Plate 1). The excavation area will extend approximately 10 feet upstream of the dam centerline to the northern (downstream) toe of the embankment. Additional space beyond the northern toe of the embankment dam will be required for the transport of excavated material to east and west stockpile areas.

The stockpile area between Clear Lake Road and the dam will require removal of a small, vertically banked drainage ditch that exists immediately east of the spillway. The vegetation found in the ditch is dominated by exotic species and a few robust natives characteristic of disturbed wetland sites. Once all stockpiled material is removed, the ditch will be restored by shaping the ditch banks to a 1 vertical on 6 horizontal slope, placing 6-inches of topsoil, and reseeding with a native seed mix. The alignment of the restored ditch will be in the approximate location of the existing ditch. The ditch bottom will be sloped to drain to the existing culverts, similar to existing conditions.

It is estimated that approximately 50,000 to 100,000 cy of material excavated from the dam will be excess and require disposal. Instead of disposing this excess material off-site, it will be beneficially used to develop up to four environmental stewardship measures as part of the proposed action to create additional marsh habitat to provide long-term stability to the lake's wildlife resources. The proposed measures consist of the construction of levees or dikes to capture and manage water behind the structure. The actual number of proposed measures to be constructed will depend on the amount of excess material available. The materials derived from dam excavation will be wet, clayish soil that is suitable to be moved, shaped and compacted by construction equipment. The material used to construct the dam was originally borrowed from Kirk Pond and is native soil. Access routes to the proposed measures may cross the lakebed and require placement of rock to provide a dry surface for operations. A geotextile fabric separator also may be used under the rock. These areas will be restored to pre-construction conditions once construction is completed.

General Description of Dredged or Fill Material

Topsoil Stripping: A 1-foot deep topsoil layer will be removed from the north face of the dam from elevation 376 to 355 feet. The quantity of topsoil to be excavated is estimated to be 14,000 cubic yards (cy). There may be additional topsoil stripping of the dam below elevation 355 feet (to elevation 345 feet), but volumes should be small since the initial construction did not include topsoil placement below elevation 355 feet. All of the grassy area to be excavated will require stripping of vegetative material.

Embankment Dam Excavation: The northern portion of the embankment will be removed. Excavation will extend from 10 feet upstream of the dam centerline to the toe of the embankment, approximately 150 feet north of the dam centerline. The back slope of the excavation will be excavated at a 1.5 horizontal to 1 vertical slope and extend to an approximate bottom elevation of 330 to 335 feet. Except in areas of transition/lateral drain construction, the excavation extends at elevation 330 to 335 feet for 15 feet downstream, and then returns to the ground surface with a 1.5 horizontal to 1 vertical slope (Plate 2). Quantities to be excavated are estimated at 400,000 cy for the embankment and 3,000 cy for the transition and lateral drains (see description in Section 3.2.2).

Description of the Proposed Discharge Sites

Temporary Long Tom River Crossing: Existing load restrictions on the Clear Lake Road bridge crossing the Long Tom River would preclude its use by large construction equipment. Access by equipment to the west lakebed stockpile area may require a temporary crossing of the river adjacent to the existing bridge in the area immediately downstream of the spillway structure. To accomplish this, a culvert will be placed in approximately 300 to 500 cy of clean fill rock across the riverbed to establish a roadway. Material with a larger gradation will be utilized to control turbidity. The area would be restored to pre-construction conditions once work is completed.

Environmental Stewardship Measures. The four environmental stewardship measures are described in the following sections (in order of priority for construction). Absent an adequate amount of material from dam excavation to construct all of the proposed measures, those measures not constructed may be considered in the future as funding becomes available.

West Coyote Marsh Impoundment. This proposed measure would restore and provide for the management of 124 acres of marsh via constructing a dike, water control structures, and rock dikes (carp excluders) within the drawdown zone of Fern Ridge Lake. The intent of the measure is the restoration of a more diverse and productive marsh plant and wildlife community in an area currently dominated by reed canarygrass.

The area to be impounded can be characterized as an upper pool level marsh dominated by reed canarygrass. A borrow ditch/channel separates the impoundment from the adjacent railroad embankment and Highway 126 to the north. The impoundment grades into upland to the east and southeast. The Middle Fork of Coyote Creek forms the impoundment boundary to the west and southwest.

Approximately 45,000 cy of excess material from dam excavation would be used to construct approximately 7,600 lineal feet of perimeter dike. This dike would have a crest elevation of 375.5 feet, which is 2 feet higher than the full pool elevation of 373.5 feet. The ground elevation would be approximately 370 feet at the lowest area and grades into the adjacent uplands. The crest width would be about 12 feet in order to support maintenance vehicle traffic. Side slopes would be 1 vertical to 6 horizontal to preclude nutria from constructing dens in and compromising the dike, and to provide for the establishment of natural marsh vegetation on the side slopes. Material originating from the dam excavation would be trucked to the site and end-dumped along the alignment beginning in the southwest corner and following the alignment to its terminus. Access would be either via local roads to the Wildlife Management Area office on Cantrell Road and then over the lakebed to the work area, or via a lakebed access route to the work area. Heavy equipment (cats, tracked excavators, scrapers, etc.) would be used to shape and compact the material in place. The levee footprint would cover approximately 8 acres of lakebed.

Overflow spillway structures, water control structures, and porous rock dikes (carp excluders) also would need to be constructed. The overflow spillway structures would have a crest elevation of 374.5 feet to prevent overtopping of the dike, and would be 80 feet long and approximately 120 feet wide (toe to toe). The overflow structures would be constructed of a 12-inch layer of 6-inch open rock to preclude erosion by water flowing over the structure. The water control structures would be composed of a horizontal 36-inch diameter pipe connected to a 42-inch diameter vertical riser with stoplogs to control water depth within the managed marsh habitat. The water control structures and dike would provide management capability to dry out the marsh area when physical measures (tillage) are required for vegetation management. The water control structure allows water to flow from the impoundment to the lake or from the lake to the impoundment, depending on the water depth in the lake, in the impoundment, and the water management requirement.

The porous rock dikes (carp excluders) form an arc around the water control and overflow structures to preclude carp access to the managed marsh impoundment. They would be constructed of 6-inch open rock to allow water to flow back and forth but precludes carp movement. The rock dikes are constructed to the required length based on an engineering evaluation of their porosity relative to the volume of water they are required to handle plus a substantial safety factor. The crest elevation and width of the rock dike would match the levee height; side slopes would be approximately 1 vertical to 2 horizontal. The 6-inch open rock would be obtained from a local quarry. A water supply pump would be installed in the future to assure water supply to the managed marsh. Water would be drawn from Fern Ridge Lake and pumped into the 124-acre marsh, as needed.

Preparation of the entire 124-acre marsh management area prior to impounding water on the site would entail mowing, tillage, and herbicide application to eradicate reed canarygrass to the extent practicable. Water management would then be used to further suppress reed canarygrass from sprouting on the site. Development of a natural marsh plant community would initially rely on seeds of these species in the soil seed bank. Supplemental seeding could be used if required to aid establishment of a natural marsh plant community. Seed sources for native wetland plant species are available at Fern Ridge Lake.

Fisher Butte Marsh Cell #2 Dike Improvement. This proposed measure would modify 8,000 lineal feet of the existing Cell #2 dike via increasing the crest width by 4 feet to improve the structural strength of the dike. The dike provides for water management capability on 220 acres of managed marsh habitat at Fern Ridge Lake. The work would occur along the majority of the northern and western alignment of the Cell #2 dike. The crest elevation of the existing dike is 375.5 feet with the base elevation at approximately 370 feet. The current crest width is approximately 8 feet and would be increased to 12 feet. The external embankment slope is currently 1 vertical to 2 horizontal and would be reconfigured to 1 vertical to 4 horizontal with this measure. Increasing the crest width by 4 feet and flattening the side slope over an 8,000 lineal foot section of the dike would impact approximately 2.75 acres of lakebed habitat, principally reed canarygrass dominated marsh.

Approximately 9,500 cy of excess material from dam excavation would be used to construct the crest extension. Material would be trucked to the site and end-dumped along the alignment beginning along the north dike alignment and follow the alignment to its terminus near the southwest corner. Access would be either via Royal Avenue and the existing ramp onto the adjacent dike and then to the work area, or via a lakebed access route to the work area. Heavy equipment (cats, tracked excavators, scrapers, etc.) would be used to shape and compact the material in place.

Gibson Island Marsh. This proposed measure would develop a 108-acre sub-impoundment via construction of a levee within the drawdown zone of Fern Ridge Lake. The measure would provide additional open water habitat during winter that supports aquatic and emergent marsh vegetation in

the shallow, upper pool zone of the lake. The area proposed for development can be characterized as unvegetated lakebed except for some emergent marsh habitat around elevation 370 feet.

An estimated 19,000 cy of material excavated from the dam would be used to construct the levee. The levee would be approximately 4,000 feet in length. The crest width would be 15 feet and side slopes would be 1 vertical to 4 horizontal. The levee footprint would cover approximately 4.3 acres of lakebed mostly devoid of vegetation. The surface of the sub-impoundment levee would be rocked to prevent erosion.

Material originating from dam excavation would be trucked to the site either via Shore Lane and then across the lakebed and end-dumped along the levee alignment or via a lakebed access route to the work area. Heavy equipment (cats, tracked excavators, scrapers, etc.) would be used to shape and compact the material in place. Excess drain rock would be used to cap the levee for erosion protection.

Trucks hauling material to the Gibson Island sub-impoundment will need to cross Amazon Creek within the lakebed. It is anticipated that a culvert will be required at the crossing location. This culvert will be removed upon completion of the work. The culvert installation will prevent the disturbance of stream sediments and their transport into the lake.

An overflow spillway about 50-feet wide (approximately toe to toe) and 100-feet long with a crest elevation of 369 feet would be constructed with a 12-inch layer of 6-inch open quarry rock. One water control structure, a 24-inch diameter pipe with a 24-inch Waterman ditch gate, would be installed under the levee at the low elevation point in case the shallow sub-impoundment requires drainage.

The sub-impoundment levee at Gibson Island Marsh will differ from those constructed principally for management of emergent marsh habitat in that it occurs in a slightly deeper portion of Fern Ridge Lake (base elevation of approximately 366 feet versus 370 feet) and the levee crest elevation (370 feet) would be 3.5 feet lower than the full pool elevation of 373.5 feet. Thus, the levee is inundated once the lake level exceeds elevation 370 feet. Once drawdown proceeds below elevation 370 feet, the levee acts to hold water in the shallow basin behind it. The overflow spillway crest elevation is 369 feet and this elevation will represent the typical surface water elevation of the sub-impoundment. Retention of water in this sub-impoundment should favor the development of an aquatic plant community in the bulk of the area. Emergent marsh vegetation would develop in the upper elevation zone of the sub-impoundment. Operation of Fern Ridge Lake for flood control purposes generally precludes the development of aquatic plant communities immediately lakeward of the emergent marsh plant communities, as these areas are dry for 4 to 5 months annually.

Dike #2 Marsh Sub-impoundment. This proposed measure would develop a 62-acre sub-impoundment via construction of a levee within the drawdown zone of Fern Ridge Lake. The measure would provide additional open water habitat during winter that supports aquatic and emergent marsh vegetation in the shallow, upper pool zone of Fern Ridge Lake. The area proposed for development can be characterized as unvegetated lakebed except for some emergent marsh habitat around elevation 370 feet.

The Dike #2 sub-impoundment is comparable in design and management prescription to that described for the Gibson Island Marsh. The levee to be constructed for this measure would be approximately 3,000 feet in length. An estimated 14,000 cy of material excavated from the dam would be needed to construct the levee. The surface of the sub-impoundment levee will be rocked to

prevent erosion. The levee footprint would cover approximately 3.0 acres of lakebed principally devoid of vegetation.

Material originating from dam excavation would be trucked to the site either via Shore Lane and then across the lakebed and end-dumped along the levee alignment or via a lakebed access route to the work area. Heavy equipment (cats, tracked excavators, scrapers, etc.) would be used to shape and compact the material in place. Excess drain rock would be used to cap the levee for erosion protection.

An overflow spillway about 50-feet wide (approximately toe to toe) and 100-feet long with a crest elevation of 369 feet would be constructed with a 12-inch layer of 6-inch open quarry rock. One water control structure, a 24-inch diameter pipe with a 24-inch Waterman ditch gate, would be installed under the levee at the low elevation point in case the shallow sub-impoundment requires drainage.

III. Alternatives

Alternative 1: Any excess material removed from construction could be trucked from the project site to an off-site location. Removing this material to an off-site location would not allow the beneficial use of this material to create the marsh impoundments. This alternative was not selected.

Preferred Alternative: The preferred alternative is to use the excess material from construction to build the impoundments as discussed above.

IV. Factual Determinations (40 CFR § 230.11)

Physical Substrate Determinations

Placement of fill material at the proposed impoundment sites will have minimal impact on the substrate. Monitoring of consolidation at the main Fern Ridge embankment shows about 0.2 inches of consolidation per foot of fill depth, with the impact extending to about one-third the depth of the fill. Based upon this data, a 10-foot high embankment will cause about 2 inches of consolidation which will take place in the top 3 feet of the substrate.

Water Circulation, Fluctuation and Salinity Determinations

Fern Ridge Lake is a fresh water lake and therefore no salinity analysis is required.

Suspended Particulate/Turbidity Determinations

There is expected to be a net decrease in turbidity and suspended sediments as a result of implementation of the impoundment measures. The impoundments will serve to trap sediment that currently erodes from the exposed lake bed during the winter draw down of the lake. These eroded sediments are currently transported through the flood control pool.

The wetlands resulting from these impoundments will also improve the water quality by trapping sediments and other contaminants and by reducing nutrients that would normally be released into the lake.

Contaminant Determinations

Sediment sampling was conducted in February 2005 within the minimum flood control pool to determine contamination levels and physical characteristics that exist within the sediment. There were five sampling stations within the minimum flood control pool; two stations were located near the face of the dam, at the water control outlet and east end of the dam. The additional three stations were collected from the delta areas where sediment collects, within the minimum pool, created by inflow from the Long Tom River and Coyote and Amazon creeks. These areas were targeted to represent sediments that could erode if the pool elevation drops below the minimum flood control pool. In addition, four surface grab samples were collected from the slope of the embankment dam, where excavation is planned for the drain repair. Because the dam was constructed in the early 1940s before the manufacturing of "modern" pesticides, such as DDT and other contaminants associated with industry in the area, the surface soil was more likely to be contaminated than the fill used to create the dam in 1941.

Evaluation of the sediment was conducted following procedures set forth in the Corps' "Upland" Testing Manual and the "Inland" Testing Manual, developed jointly by the Corps and the U.S. Environmental Protection Agency, to assess dredged material. Guidelines used are those developed to implement the Clean Water Act. These guidelines and associated screening levels are those adopted for use in the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF), November 1998 (signed by the Corps, Environmental Protection Agency, Washington Department of Ecology, Oregon Department of Environmental Quality and Washington Department of Natural Resources).

On February 10, 2005 a total of five surface grab sediment samples and the four surface soil samples from the dam were submitted for physical analyses including total volatile solids and also were analyzed for metals (nine inorganic), total organic carbon, pesticides and polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables and polynuclear aromatic hydrocarbon (PAHs). In addition, the sediment and soil samples were submitted for an elutriate extraction, with the overlying water analyzed as a whole water fraction and a dissolved water fraction for all methods listed above.

The chemical analyses indicated only extremely low levels of contamination in any of the samples, with all levels well below their respective DMEF screening levels. No pesticides or PCBs were detected in any of the samples at very low detection levels. Several PAHs and metals were detected, but at low levels. Detection levels were sufficiently low enough to evaluate material as presenting no environmental concerns from contamination, if the material were to pass the dam due to either storm events or lowering of the pool to less than historic minimum operating elevation levels.

Aquatic Ecosystems and Organism Determination

Threatened and endangered species: The ESA-listed plant species and Fender's blue butterfly occupy wet prairie habitat that is outside the area where environmental stewardship measures are proposed via construction of impoundments for water management and development of natural marsh vegetation communities.

The two small colonies of Fender's blue butterflies located in the Shore Lane Management Unit may be affected by collisions with haul vehicles if Shore Lane Road is used for hauling excess materials for construction of the environmental stewardship measures. Conservation measures to reduce potential impacts include the following:

- Reduce vehicle speeds when in proximity of the known colonies in the Shore Lane Management Unit.
- Continue the Fender's blue butterfly monitoring program at the site and restrict use of the haul road until after egg-laying has been completed (mid-June).

Fish, crustaceans, mollusks, and other aquatic organisms in the food web: Construction of levees and associated structures for marsh restoration at West Coyote would occur when the lake is drawn down. Thus, there is no direct construction related impact to these species. Restoration of these areas to native marsh vegetation through water management, tillage, scarification and/or herbicide use would be beneficial to most of these species through provision of a future, more diverse and natural plant community and hydrologic regime than the current reed canarygrass monocultures that are subject to annual drawdown for flood control purposes. The rock dikes would prevent fish, principally carp and other non-native species, from entering the impoundment post-construction. The lack of carp within the impoundment will lead to better water clarity and greater light penetration of the water column. This will be beneficial to establishment and growth of emergent and aquatic plants, which will benefit aquatic organisms and increase overall productivity of the marsh habitat.

The Fisher Butte Marsh Cell #2 Dike Improvement measure would ensure that the managed marsh habitat interior to the dike is not compromised by dike failure. The Gibson Island Marsh measure would retain water post-drawdown in a 108-acre area. This would provide habitat (water, aquatic vegetation) during the course of the drawdown period that would support these species assemblage. For the current operation scenario, the area is mudflat with minimal habitat value to any species. The Dike #2 Sub-impoundment is a 62-acre area that would operate and provide benefits comparable to Gibson Island Marsh.

There would be some loss of habitat for this species complex from the base of the levee footprint required to implement these proposed measures. This loss would only pertain to the period when the lake level exceeds the base elevation of the proposed structures. The quality of habitat impacted under the current operation scenario of lake drawdown for flood control purposes is poor as there are no associated aquatic or emergent plant communities, only barren lakebed. Levee footprints for the proposed measures are: West Coyote – 8 acres; Fisher Butte Marsh Cell #2 – 2.75 acres; Gibson Island Marsh – 4.3 acres; and Dike #2 Sub-impoundment – 3.0 acres.

Other wildlife: There would be minimal impact to other wildlife species during construction of the proposed measures, as they would be built when the pool is drawn down and the sites are dry. The West Coyote area, when the lake is drawn down, would still retain marsh vegetation in the form of a reed canarygrass monoculture that provides cover and forage for some birds, small mammals and reptiles/amphibians. The reed canarygrass habitat would be converted throughout the 124-acre site through tillage, scarification, herbicide use, borrow operations, and construction of the water control structures. These impacts are temporary in nature as once construction is completed and water management is instigated, natural marsh communities are expected to develop quickly providing a more diverse and productive plant community, which in turn is expected to support a more diverse and numerous wildlife species complex. Waterfowl and wading birds are expected to make extensive use of the restored marsh habitat. Western pond turtles should benefit from the proposed measure. Various songbirds should make extensive use of the natural marsh habitat expected to develop for foraging and nesting activities.

The Gibson Island Marsh and Dike #2 sub-impoundment would be constructed on portions of the Fern Ridge lakebed that are exposed soil during drawdown. These areas receive minimal use by wildlife due to the absence of vegetation and cover. Some use by killdeer or a few other species that utilize large expanses of open, non-vegetated areas may occur. Post-construction, these sub-

impoundments would provide for pooling of water throughout the drawdown period that would provide for establishment of emergent and aquatic vegetation and associated invertebrates. The sub-impoundment areas would provide foraging resources for waterfowl, wading birds, shorebirds, and some small mammals. Extensive use of the impounded water at these locations may occur by night-roosting, wintering waterfowl including Canada geese, various duck species and tundra swans.

Sanctuaries and refuges: The proposed structures and restoration areas all lay within the boundaries of the ODFW's FRWA. The Corps licenses the lands comprising the FRWA to ODFW. The FRWA provides food crops, water management areas for marsh habitat development and wildlife use, large expanses of non-managed habitat and recreational opportunities for birders and hunters. The proposed actions are expected to improve the wildlife use of the FRWA by providing habitat conditions that are an overall improvement from the reed canarygrass monoculture at West Coyote and the exposed lakebed that currently occurs at the Gibson Island Marsh and Dike #2 Sub-impoundment. Human access to the West Coyote dike would be controlled seasonally comparable to access at other dike locations currently within the FRWA. The nature of the structures for water control would not necessitate frequent maintenance actions. Some maintenance actions would be required but are comparable to the other water management structures on the FRWA.

Wetlands: The proposed measures will improve wetland habitat conditions over the existing condition of exposed lakebed at the Gibson Island Marsh and Dike #2 sub-impoundments plus West Coyote. Gibson Island Marsh and Dike #2 sub-impoundments will provide for development of aquatic and emergent marsh plant communities on approximately 170 acres at locations that are currently exposed, barren lakebed during drawdown. The conversion of a reed canarygrass monoculture at the West Coyote location to a 124-acre marsh dominated by a diverse assemblage of native wetland plant species will improve the sites productivity and use by wildlife.

The stockpile area between Clear Lake Road and the dam will require removal of a small, vertically banked drainage ditch that exists immediately east of the spillway. This ditch is used to collect surface runoff from the embankment dam and the county road. The vegetation found in the ditch is dominated by exotic species and a few robust natives characteristic of disturbed wetland sites. Dominant species include slough sedge (*Carex obnupta*), common rush (*Juncus effuses*), swordleaf rush (*Juncus ensifolius*), fringed willow herb (*Epilobium ciliatum*), Nootka rose (*Rosa nutkana*), and Douglas spiraea (*Spiraea douglasii*). Once all stockpiled material is removed, the ditch will be restored by shaping the ditch banks to a 1 vertical on 6 horizontal slope, placing 6-inches of topsoil, and reseeding with a native seed mix. The alignment of the restored ditch will be in the approximate location of the existing ditch. The ditch bottom will be sloped to drain to the existing culverts similar to existing conditions.

Mud flats: The impoundments will be built within a lake bed of Fern Ridge Lake, a flood control reservoir that is annually drawn down in the fall for flood control storage purposes. This drawdown exposes large, barren areas of the lakebed. The majority of the exposed lakebed does not function like a natural mudflat due to the depth and length of inundation with the exception of the perimeter areas of the lake where shallow waters and gradual drawdown due to evaporation and water release expose mudflat areas that support algal growth and invertebrates.

The Gibson Island Marsh and Dike #2 sub-impoundments would occur in portions of Fern Ridge Lake that grade from elevation 366 feet to 370 feet (full pool occurs at elevation 373.5 feet). Spillway elevations for these sub-impoundments are at elevation 369 feet, which will essentially represent the full pool elevation behind these structures during winter drawdown of Fern Ridge Lake. Due to the greater permanence of water in these sub-impoundments and the expected development of aquatic and emergent plant communities, the mud-flat habitat that is will also occur within these sub-

impoundments is anticipated to have a more productive invertebrate community. The mudflat/shallow water portion of these sub-impoundments is expected to be used by forging shorebirds in the fall and winter.

Vegetated shallows: Vegetated, shallow-water areas occur at West Coyote impoundment. The current situation is a reed canarygrass monoculture. Post-construction, the West Coyote impoundment is expected to support a more diverse wetland plant community dominated by native wetland plant species. Carp would be precluded from the area through the use of porous rock dikes around the water control structures. Future productivity of the vegetated shallows in West Coyote will exceed that of the current situation. The Gibson Island Marsh and Dike #2 sub-impoundments will result in the development of shallow-water areas with aquatic and emergent plant communities that are currently unvegetated lakebed.

Coral reefs: Coral reefs are not present.

Riffle and pool complexes: The impoundments will not impact stream flows in the Long Tom River or other tributary streams that enter and flow through (during drawdown) Fern Ridge Lake. Therefore, there will be no impact to riffle and pool complexes.

Municipal and Private Water Supplies: There are no municipal or private water supply intakes in the vicinity of the material placement sites.

Recreational and Commercial Fisheries and Water-related recreation: Minimal impacts to water-related recreation are anticipated. During low water periods, the sub-impoundment levees may prevent boat access into the interior waters. Such access issues are expected to be of limited duration and would probably be offset by the improved habitat conditions that should benefit recreational fishing activities. The sub-impoundments are not located in areas typically used by power or sail boaters due to the shallow water depths. The existing reed canarygrass marsh at West Coyote effectively precludes recreational fishing use of the site; thus, the marsh restoration action at this location would have no impact. There are no commercial fisheries at the project.

Aesthetics: There will be no adverse impacts to aesthetics. The development of plant communities at the impoundment locations plus the associated attraction of wildlife will improve the aesthetics of these locations.

Parks, etc: There are no parks in the area of the proposed impoundments.

Proposed Disposal Site Determinations

Material from the dam repair would be placed in the dry on the drawn down lakebed. The sub-impoundment locations will be quite distant from the remaining pool behind Fern Ridge dam. Dike material will be compacted upon placement and excess drain rock from dam repair will be used on the sub-impoundment dikes to prevent erosion. The West Coyote dike will have gentle (1 vertical to 6 horizontal) side slopes that will develop a vegetative mat quickly. These factors, in addition to the raised Highway 126 and railroad roadbeds that serve as windbreaks, will minimize any potential for sediment runoff from the levees at West Coyote.

Determination of Cumulative Effects on the Aquatic Ecosystems

Placement of the material to form the sub-impoundments and the West Coyote dike will occur in the dry as the lake will have been drawn down for dam repair. The expected improvements to the aquatic

and emergent wetland plant communities have been noted above. These actions represent improvements to the overall aquatic ecosystem of Fern Ridge Lake and would substantially exceed any losses attributable to the footprint of the levees.

The drawdown, either associated with the dam repair or flood control purposes, already compromises the benthic organisms at these locations. The proposed restoration actions would result in a more stable and productive benthic organism community in the future as water would typically remain on these sites most of the year (Gibson Island Marsh and Dike #2 sub-impoundments) or fluctuate comparable to a natural marsh ecosystem (West Coyote).

Determination of Secondary Effects on the Aquatic Ecosystems

Some overland flow would be anticipated to enter the West Coyote impoundment during heavy winter rains. Sediment carried by this winter run-off would be anticipated to be trapped by the marsh vegetation within the impoundment. The stilling effect of the impounded waters would also result in settlement of run-off borne sediments. During very heavy precipitation events that lead to localized or even regional flooding, the West Coyote impoundment can be expected to fill with water and discharge these waters via the water control structure and/or the overflow spillway to Fern Ridge Lake. This would not be substantially different from the present condition where high precipitation events lead to sediment laden runoff entering the lake via the Middle Fork of Coyote Creek.

V. Findings of Compliance (230.12)

Based upon the foregoing factual determinations and following requirements of the 404(b)(1) Guidelines, the proposed disposal site(s) for the discharge of dredged or fill material complies with the Guidelines.

a. Alternatives (230.10(a))

There is no practicable alternative, which would have less adverse impact on the aquatic ecosystem.

b. Restrictions on Discharge (230.10(b))

The discharge will not cause or contribute to violations of State water quality standards.

The discharge will not violate any applicable toxic effluent standard or prohibition under section 307 of the Act.

The discharge will not jeopardize the continued existence of species listed as threatened or endangered under the ESA or result in the destruction or adverse modification of critical habitat.

The discharge will not violate any requirement imposed under the Marine Protection, Research and Sanctuaries Act of 1972.

c. No Significant Degradation (230.10(c))

The discharge will not cause or contribute to significant degradation of waters of the United States through effects to:

Human health or welfare, including effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites.

Life stages of aquatic life and other wildlife dependent on aquatic ecosystems.

Aquatic ecosystem diversity, productivity, and stability, including effects to loss of fish and wildlife habitat or loss of capacity of wetland to assimilate nutrients, purify water or reduce wave energy.

Recreational, aesthetic, and economic values.

d. Minimization of Impacts (230.10(d))

Appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

Date: May 2, 2005

RICHARD W. HOBERNICHT
Colonel, EN
Commanding